

REMARKS

Claims 11-14 and 16-20 are pending in the present application. No claims have been amended, Claims 12-14 and 16 remain withdrawn, no claims have been canceled and Claim 21 has been added, leaving Claims 11-14 and 16-21 for consideration upon entry of the present Amendment and Response.

New Claims

New Claim 21 has been included to further claim the invention. Support for this claim can be found in previously presented Claims 11 and 17, and in the Specification on p. 6, lines 20-23. No new matter has been introduced with this amendment.

Reconsideration and allowance of the claims is respectfully requested in view of the above amendments and the following remarks.

Claim Rejections Under 35 U.S.C. §103(a)

Claims 11-14 and 16-20 are rejected under 35 U.S.C. § 103(a) over U.S. Patent No. 5,346,799 ("Jeffries") or U.S. Patent No. 5,324,620 ("Ebersole"), in view of U.S. Patent No. 5,853,949 ("Kodama"), U.S. Patent No. 5,346,799 ("Sheriff"), and U.S. Patent No. 6,232,031 ("Gracia"). Applicants respectfully traverse the rejection.

Jeffries teaches an alkali-soluble novolak binder resin made by the condensation reaction of a mixture of phenolic monomers. See Abstract. Ebersole teaches a radiation-sensitive composition dissolved in a solvent comprising (A) a photoactive compound; (B) an alkali-soluble novolak binder resin. See Abstract.

Kodama discloses a nitrogen-substituted polyphenol compound used in a photoresist composition along with an alkali soluble novolac compound. Col. 6, line 32 to Col. 7, line 5. Kodama teaches the use of surfactants in a positive working photoresist. Col. 11, lines 55-59.

Gracia teaches a positive-working coating composition comprising a novolak, resole, or polyvinyl resins with phenolic hydroxide groups, and o-diazonaphthoquinone. Col 2, line 53 to Col. 3, line 10. A surfactant (BYK 344) is disclosed. Col. 4, line 31.

Sheriff teaches infra-red imaging compositions containing only two essential components, a mixture of a phenolic resin and an o-diazonaphthoquinone derivative, a

reaction product of a phenolic resin and an o-diazonaphthoquinone derivative, or a combination of these; and a non-basic infrared absorbing compound. Col. 3, lines 55-65. Surfactants in "conventional amounts" are disclosed. Col. 7, lines 60-61. Sheriff teaches use of a polyether-modified polydimethylsiloxane surfactant (BYK-307). Col. 10, lines 8-10.

For an obviousness rejection to be proper, the Examiner must meet the burden of establishing a *prima facie* case of obviousness, i.e., that all elements of the invention are disclosed in the prior art; that the prior art relied upon, coupled with knowledge generally available in the art at the time of the invention, contain some suggestion or incentive that would have motivated the skilled artisan to modify a reference or combined references; and that the proposed modification of the prior art had a reasonable expectation of success, determined from the vantage point of the skilled artisan at the time the invention was made. *In re Fine*, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988); *In Re Wilson*, 165 U.S.P.Q. 494, 496 (C.C.P.A. 1970); *Amgen v. Chugai Pharmaceuticals Co.*, 927 U.S.P.Q.2d, 1016, 1023 (Fed. Cir. 1996).

Further, even assuming that all elements of an invention are disclosed in the prior art, an Examiner cannot establish obviousness by locating references that describe various aspects of a patent applicant's invention without also providing evidence of the motivating force which would have impelled one skilled in the art to do what the patent applicant has done. *Ex parte Levengood*, 28 U.S.P.Q.2d 1300 (Bd. Pat. App. Int. 1993). The references, when viewed by themselves and not in retrospect, must suggest the invention. *In Re Skoll*, 187 U.S.P.Q. 481 (C.C.P.A. 1975). None of the references cited above disclose or teach all the limitations of the method claimed in instant Claim 11. In particular, none teach that the composition of the photoresist composition can be adjusted to prevent stain formation when an MMN coating head is used to coat the photoresist composition onto a large substrate, and none teach or disclose controlling stains as claimed in Claim 11 by formulating the particular claimed components in proportions within the compositional ranges given that are suitable to provide low staining, as determined functionally by coating large scale substrates (e.g., glass) with the claimed coating equipment (i.e., a multi-micro nozzle (MMN) head coater) composition.

The Examiner contends, in the Office Action dated October 4, 2006 on p. 5, about line 14, that with respect to the method of preventing stains as claimed in instant Claim 11, the controlling steps to prevent stains and improve coating properties are inherently present in the methods of the prior art. Applicants respectfully disagree, and note that the theory of inherency is normally reserved for rejections under 35 U.S.C. § 102. *In re Grasseli*, 318 U.S.P.Q. 303 (Fed. Cir. 1983). Applicants assert that the inventive step claimed herein of preventing stains in the specific application of coating of large scale surfaces is a non-obvious functional limitation which governs formulation of the relative ratios of the disclosed components (polymer resin, diazide photoactivatable compound, organic solvent, and Si-based surfactant; and optional crosslinker; and in particular, the synergies provided by the solvent and Si-based surfactant) within the claimed ranges, and that none of the references teaches or discloses a combination of formulated components that provides this particular property.

Furthermore, it is respectfully submitted that the Examiner has inappropriately used the doctrine of inherency in putting forth a rejection under 35 U.S.C. §103 (a). The courts have repeatedly made the distinction that “the inherency of an advantage and its obviousness are entirely different questions. That which may be inherent is not necessarily known. Obviousness cannot be predicated on what is unknown.” *In re Spormann*, 150 U.S.P.Q. 449, 452, (CCPA, 1966), citing *In re Adams*, 53 CCPA 996, 356 F.2d 998, 148 U.S.P.Q. 742. For the reasons discussed hereinbelow, Applicants respectfully assert that the claimed combination of components, particularly solvent and surfactant, in combination with each other and the other claimed components of the coated photoresist, provide an unexpected and synergistic advantage in preventing stain formation using the claimed MMN head coater and photoresist composition, which is not obvious, and that withdrawal of the rejection of obviousness under inherency is respectfully requested.

For reasons disclosed in the previous Response to the Office Action dated June 27, 2006 and as summarized herein, none of the references (Jeffries, Ebersole, Kodama, Gracia, or Sheriff) specifically discloses or teaches the claimed method of coating a photoresist by a multi-micro nozzle (MMN) coating head. See Jeffries, Col. 10, lines 64-67; Ebersole, Col. 12, lines 23-26; Kodama, Col. 13, lines 16-20; Gracia, Col. 3, line 66

to Col. 4, line 1; and Sheriff, Col. 8, lines 47-49. Thus, as the references do not disclose or teach the specific set of coating conditions including the MMN coating head and the large substrate, a combination of the above references would therefore fail to teach or disclose all elements of the amended instant claims.

As discussed in the previous response to the Office Action dated June 27, 2006 and as elaborated upon herein, Jeffries and Ebersole both identically disclose scum formation between imaged features *upon development of a photoresist with a basic developer*, attribute the post-develop scum formation to oligomeric species such as p-cresol dimer present in the photoresist, and both disclose elimination of the scum formation by using a novolak prepared by a synthesis and purification process that minimizes the presence of such scum-forming oligomers; however, neither reference teaches a method that prevents stain formation, which as disclosed in the instant Specification is observable upon coating and prior to development, but does not appear as scum in post develop lines. See Jeffries, Col. 3, lines 10-44; and Ebersole, Col. 3, lines 9-43 and Col. 19, lines 45-46; and the instant Specification on p. 11, lines 1-20, in FIGs 2 and 6A-E.

Jeffries and Ebersol both disclose Si containing surfactants; however, and as noted by the Examiner, each provide examples prepared using FLUORAD® FC-430, from 3M Company, which is in fact a *fluorinated organic* surfactant and not a silicon-containing surfactant. Jeffries, Col. 15, lines 32-35; Ebersole, Col. 18, lines 48-50. As is well known to anyone practicing in the photoresist art, FC-430 is a nonionic fluorocarbon-based surfactant (not silicone-based) which has recently and notably received substantial public attention and is no longer marketed due to environmental questions surrounding the biopersistence of the breakdown product of the perfluorooctanesulfonate functionality that provided this particular type of surfactant with its desirable properties, and which properties have generally been observed by those practicing in the art, at low loading levels relative to other commercial non-ionic surfactants and in photoresist and other applications, to be difficult to reproduce with equivalent amounts of other commercial surfactants. It is thus unclear to one skilled in the art whether the examples of the references (Jeffries and/or Ebersol) teach the use a silicone-containing surfactant or a fluorocarbon as disclosed, as the examples explicitly

teach a known fluorocarbon surfactant, and these references cannot therefore provide a clear teaching to one skilled in the art that a silicon-based surfactant would provide a reasonable expectation for success in a photoresist composition, particularly a photoresist composition optimized to provide a method of controlling stain formation as claimed in the instant claims.

To the contrary, based on their disclosure of the use of the known fluorinated FC-430 surfactant, Jeffries and Ebersole each provide as working examples compositions that are compositionally similar, not to Examples 1-3 disclosed in the instant Specification on p. 9 and as claimed in instant Claim 11, but rather to Comparative Example 1 in the Specification on p. 9, which specifically discloses use of a fluorine-containing surfactant and the undesired stain formation obtained therewith. Consequently, the examples of Jeffries and Ebersole would not be expected to work at all in providing a stain-free coating as claimed, but would be expected to provide instead a stained photoresist film as a result of the inclusion of a fluorinated surfactant as shown in FIG. 6A of the instant Application.

Further, the working solvent systems disclosed in Jeffries (ethyl lactate and ethyl-3-ethoxypropionate, EL and EEP, in a 70/30 weight ratio) and in Ebersole (ethylene glycol monoethyl ether acetate, EGMEA), provide no basis for expecting the synergistic effect alluded to in the instant Specification on p. 11, lines 18-20, with the solvent system of the disclosed instant Examples and the silicon based surfactant as claimed. Thus, each of Jeffries and Ebersole provides only an expectation that scum formation in the imaged features (post-develop) may be prevented by using a novolak with a low p-cresol oligomer content and incidentally a fluorinated organic surfactant, and do not provide a teaching or reasonable expectation that the large-surface coating phenomenon of staining can be prevented by coating the photoresist composition as claimed in the instant claims.

Also as described in the previously filed response to the Office Action dated June 27, 2006 and elaborated on herein, Kodama discloses testing for the presence of scum in post-develop testing of photoresist, but does not disclose prevention of stain formation in post-coated, pre-developed photoresist coated substrates by coating the photoresist composition claimed in the instant claims. Col. 23, line 57 to Col. 24, line 20. Kodama also teaches that a surfactant may be used in order to improve on coating properties such

as striation, and discloses organosiloxane surfactants such as Shin-Etsu KP341, but fails to disclose the polyoxyalkylene dimethylpolysiloxane copolymer compound claimed in the instant Claims. Col. 11, lines 25-27. One skilled in the art will fully appreciate that spin-coat striations, alluded to in Kodama, are attributable to evaporative formation of Benard cells which can form at the center of spin-coated substrates and which cause striation lines that tend to radiate outward in all directions from a central point, with a greater or lesser intensity depending on the prevalence of the cells, and that one skilled in the art would readily appreciate that such striations bear no resemblance in size or pattern to the exemplary cloudy stains, pin stains, chuck stains, or center/lateral stains shown in FIG. 2 of the instant Specification as obtained by spray/spin coating as disclosed in the instant Specification and as claimed in the instant claims. In addition, Kodama discloses that a fluorine type and a silicon type surfactant are preferred, and discloses that the surfactant may be used alone or as a combination. Col. 11, lines 50-61. However, Kodama does not disclose or teach use of the specific polyoxyalkylene dimethylpolysiloxane surfactants for prevention of the stains claimed in instant Claim 11, and further makes no distinction between performance resulting from the use of fluorine type and silicon type surfactants. In addition, though Kodama discloses specific solvents, Kodama does not disclose, teach, or suggest specific solvent composition including proportions as a factor in controlling coating defects. Col. 11, lines 1-18. Thus, Kodama fails to teach the synergistic combination of solvents and the surfactant claimed in the instant claims.

Sheriff and Gracia, which disclose silicone surfactants BYK 307 (Sheriff, Examples 1-11), and BYK 344 (Gracia, Examples 1-4) are nonetheless each silent as to coating defect prevention of any kind, and therefore do not disclose or teach the prevention of stain formation in a coated photoresist film as claimed in Claim 11. Gracia discloses as solvents dimethylformamide, acetone, ethanol, and 1-methoxy-2-propanol, and emphasizes the relative ratio of infrared absorbing dye to diazonaphthoquinone moiety, but fails to teach a synergistic combination of solvent and surfactant as disclosed in the instant Specification. Col. 4, lines 1-2 and Examples 1-4; Col. 2, lines 34-37. Sheriff discloses that surfactants are "optional, non-essential components", and further discloses solvents broadly and only provides a single exemplary solvent, 1-methoxy-2-

propanol, and not a synergistic combination of solvent and surfactant as disclosed in the instant Specification. Col. 7, lines 58-61; Col. 8, lines 37-42. Thus, Gracia and Sheriff each fail to provide a teaching that would motivate one skilled in the art to combine Gracia or Sheriff with either of Ebersole or Jeffries (or Kodama) to overcome their deficiencies, and fails to provide a reasonable expectation for the successful combination to provide the method of coating the photoresist composition claimed in Claim 11. Kodama, Gracia, or Sheriff in combination with either Ebersole and/or Jeffries thus fail to provide a teaching or reasonable expectation that the large-surface coating phenomenon of staining can be prevented by coating the photoresist composition specifically comprising a silicon-containing surfactant as claimed in the instant claims, and therefore even when combined do not teach or disclose all elements of the instant claims.

Therefore, to summarize, the combination of Jeffries or Ebersole with Kodama, Sheriff, or Gracia fails to disclose or teach all elements of the instant claims; that the combination of any of these references coupled with knowledge available in the art fails to provide a motivation to modify any one or more of these references to include the limitations of solvent and silicon containing surfactant in a photoresist coated using an MMN head coater on a large substrate, that the combination in light of the teachings therein and knowledge generally available in the art fails to teach that the combination of references would provide a reasonable expectation for success for the combination, and that the method claimed in the instant claims unexpectedly provides synergistic and desirable results that are not taught in the references and are not inherent to the composition. Thus, the combination of these references does not make unpatentable the instant claims.

It is believed that the foregoing remarks fully comply with the Office Action and that the claims herein should now be allowable to Applicants. Accordingly, reconsideration and allowance is respectfully requested.

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If there are any additional charges with respect to this response or otherwise,
please charge them to Deposit Account No. 06-1130.

Respectfully submitted,

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